

# VIPER

---

VOLUME 2, ISSUE 5

AN ARESCO PUBLICATION

NOVEMBER 1979, \$2.00

---

## TABLE OF CONTENTS

Editorial.....	2.05.02
Reader I/O.....	2.05.04
CHIP-8 INTERPRETER	
Little Loops.....Tom Swan.....	2.05.06
Can't This Thing Go Any Faster? Tom Swan.....	2.05.10
VIP GAMES	
Football.....Frank Awtrey.....	2.05.12
Modifications to Kaleidoscope.. Charles Williams..	2.05.23
MISCELLANY	
Product Review: VP700 BASIC.....Tom Swan.....	2.05.24
Get Ready For More PIPS!.....Advertising.....	2.05.26
Trendcom Printer Output Sample.....	2.05.27
H C Will Software.....Advertising.....	2.05.23

REMEMBER\*\*\* There's no issue in December! Everyone have a great holiday season, and be sure to let us know whether or not you're interested in either the light pen or the printer.

I just noticed - we don't have any Christmas music on Super Sound yet!

And another item: We've just opened a real computer store in Columbia, where we should be able to have VIP items on the shelves! Come on in and visit with us a while!

Merry Christmas! Happy Thanksgiving! Happely New Year!

## SUBSCRIPTION RATES, ADVERTISING RATES, & OTHER INFORMATION

THE VIPER IS PUBLISHED TEN TIMES PER YEAR BY Aresco Inc., AT 6303 GOLDEN HOOK, COLUMBIA MD 21044. MAILED TO SUBSCRIBERS ON THE 15TH DAY OF EACH MONTH EXCEPT JUNE AND DECEMBER. SINGLE COPY PRICE IS \$2 AND SUBSCRIPTION PRICE IS \$15 FOR ALL 10 ISSUES OF THE CURRENT VOLUME. SUBSCRIPTIONS DO NOT CARRY OVER FROM ONE VOLUME TO THE NEXT. SUBSCRIBERS WHO WISH TO ORDER LESS THAN THE FULL VOLUME SHOULD SEND \$2 FOR EACH ISSUE DESIRED. RENEWALS ARE ACCEPTED DURING THE LAST TWO MONTHS OF THE CURRENT VOLUME YEAR, AND THE FIRST ISSUE OF EACH VOLUME IS PUBLISHED IN JULY. ENTIRE CONTENTS OF THE VIPER COPYRIGHT 1979 BY Aresco Inc.

APPLICATION TO MAIL AT SECOND CLASS POSTAGE RATES IS PENDING IN COLUMBIA MD 21045. POSTMASTER: SEND ALL ADDRESS CHANGES TO THE VIPER, BOX 1142, COLUMBIA MD 21044.

THE VIPER IS AN Aresco Inc. PUBLICATION. EDITOR: TERRY LAUDEREAU, CO-EDITOR: RICK SIMPSON. CORRESPONDING EDITOR IS TOM SWAN. READERS ARE ENCOURAGED TO SUBMIT ARTICLES OF GENERAL INTEREST TO VIP OWNERS FOR PUBLICATION IN THE VIPER. MATERIAL SUBMITTED WILL BE CONSIDERED FREE OF COPYRIGHT RESTRICTIONS. THOSE SUBMISSIONS RECEIVED BY THE 1ST DAY OF A MONTH WILL BE CONSIDERED FOR INCLUSION IN THAT MONTH'S ISSUE.

### SUBSCRIPTION RATES:

USA RESIDENTS: \$15/10 ISSUES. NON USA RESIDENTS SHOULD INCLUDE AN ADDITIONAL \$10 FOR AIR MAIL POSTAGE. IF SUCH POSTAGE IS NOT INCLUDED WITH THE ORDER, THE NEWSLETTER WILL BE SENT SECOND CLASS WITH THE REMAINDER OF THE MAILING. PURCHASE ORDERS WILL NOT BE ACCEPTED. IF SUBSCRIBER SPECIFIES UPS COD THE FIRST ISSUE WILL BE SENT COD WITH THE COLLECTIBLE AMOUNT TO BE \$15 PLUS A \$1 COD CHARGE PLUS SHIPPING COSTS. PERSONAL CHECKS, MASTER CHARGE, AND VISA ORDERS ARE ACCEPTED. CHECKS DRAWN ON FOREIGN BANKS SHOULD BE PAYABLE IN U. S. DOLLARS.

### ADVERTISING RATES:

CLASSIFIED ADVERTISING: \$10/3 LINES OF 60 CHARACTERS EACH.

### PAGE RATES:

FULL PAGE	\$85
HALF PAGE	\$45
QUARTER PAGE	\$25

PAYMENT MUST ACCOMPANY ADS. ADS SHOULD BE CAMERA READY POSITIVE ARTWORK. IF OUR PRINTER CHARGES US EXTRA FOR PREPARING YOUR AD COPY, WE WILL BILL YOU AT COST + 10%.

THE ENTIRE CONTENTS OF THE VIPER ARE COPYRIGHTED BY Aresco Inc. PLEASE DO NOT MAKE COPIES FOR YOUR FRIENDS.

DEALERS ARE INVITED TO REQUEST THE Aresco Inc. DEALER INFORMATION PACKAGE BY WRITING IN CARE OF DEALER SERVICES.

VIP AND COSMAC ARE REGISTERED TRADEMARKS OF RCA CORP. THE VIPER IS NOT ASSOCIATED WITH RCA IN ANY WAY, AND RCA IS NOT RESPONSIBLE FOR ITS CONTENTS. READERS SHOULD NOT CORRESPOND WITH RCA REGARDING VIPER MATERIAL. DIRECT ALL INQUIRIES TO Aresco AT OUR ADDRESS.

E D I T O R I A L  
by Terry L Laudereau

Editorials are getting harder and harder to write! If I remember that this is my chance to talk to you, it's much easier than thinking I have to write a "real" editorial.

Any more interest in the light pen? We've put our order in for the first hundred, and we're told we'll get delivery by the end of November. As with PIPS, we're being amazed by the number of orders for it! Now that we have the store, we may be able to stock things like this on a regular basis, and after our first order is filled, we should be able to keep them around for the famous ARESCO overnight service.

Also in this issue is the spec sheet on the Trendcom printer mentioned last month. The printer output doesn't reproduce very well, I'm afraid, but we included it anyway just in case you want to see it before making up your mind.

Remember - you have to think up an interface card for it. If someone designs one, and is willing to build it for us, how many of you would buy it in preference to building your own?

We received a reader suggestion that we offer authors at least a token payment (in terms of software or a free subscription or something) for writing. I'm willing to listen if enough of you concur, but I think that spoils the camaraderie of the whole thing. We aren't making money on this venture (mostly because we don't have a huge subscriber base and a lot of advertisers), and I doubt that anyone else is, either. We pay royalties on a few software items - mostly to those authors who specifically said they wanted royalties for their work. We pay 20% of the retail price of every copy sold. For some people, this can be a lot of money. But if we have to pay a royalty, then we have to add that royalty into the cost of the program you buy (which is why not all of our software is only \$5). It's different with the VIPER, because if we paid only 2% per copy sold, it would add up to \$10 (we have 481 subscribers and sell a few copies to dealers). We have an average of 6 articles per issue - so we'd be paying \$60 per issue for articles. Right now, our costs are only a few dollars higher than our income, and when we reach 500 subscribers, we stop losing money. If we hit 525 subscribers, we start making money, and at that point we'll be able to pay for articles. It's interesting to note that for Volume I of the VIPER, we've sold nearly 50 copies of the volume since Volume II started. With 3 more sales of Volume I sets, it will have paid for itself!

I think it would be fair if we sent back a tape for every tape you send us, so you won't run out of tapes. We stock C-10 cassettes, which we sell for the same price as Microsette (who makes them) which is \$7.50/10 cassettes. However, we do not have the plastic boxes Microsette provides. We didn't get them because we wanted to cut our costs a bit (we have to pay postage to get the cassettes to us from California).

Can we have some feedback on the "token of appreciation" question? Especially from those of you who do write for the VIPER?

Now that we have the store open, we've ordered a supply of VIP boards from RCA. The plan is that we'll have at least one of everything (except, of course, the phantom keyboards) in the house, so that when you order, we can send your goods out the next day like we send out your ARESCO products. Then we'll order another. It will take awhile to get enough things to keep a goodly supply (so you can't order them faster than we can get them), but I think that by January or February, we should have it straightened out a bit.

Also - for those of you in the New York area: Harvey Electronics has announced that it will be carrying the VIP line! So we have another foothold in the country. We're glad to welcome Harvey Electronics to the VIPER, and hope he and his customers enjoy the machine as much as the rest of us do!

One more minor detail here. PIPS III is almost ready to go to the printer. We have 10 or 15 orders for it (we need only 35 orders to go to press), so it looks like we may be able to once again get it out to you before the announced publication date. No promises, but it looks good.

Have to apologize for not telling anyone that the tape for PIPS II has two programs (each saved twice) and two data files (each saved once) on it. We were in such a hurry to ship it that we didn't put a table of contents in with the tape! What's more, (sigh!), we probably never would have noticed if one - and so far, only one - reader hadn't called and told us off about it. (Well, not really told us off, but when you feel guilty, even a minor "tsk-tsk" feels like a major chewing out!)

Several readers have mentioned several times that they'd like to see a classified ad section in the VIPER, but no one's sent in any ads. Today someone said that the reason is that we decided to charge for classifieds - and that ain't right. Okay - it's your newsletter. If having to pay for the ads kept you from sending in classified ads, then we'll stop with the payment bit. But the ads have to be strictly non-commercial. If the payment wasn't a factor, perhaps we still won't get any classified ads, but at least we'll know. By the way - if you are willing to pay for classified ads, we might use that income to pay authors for writing for us! (Just a thought.)

Please write and let us know what you think about all this - and remember, there's no VIPER in December. We'll see you again in January, so have a happy Thanksgiving and a Merry Christmas, and good luck (as Tom Swan would say) with your programming!

Regards,



Terry L. Laudereau

Terry & Rick - I have again risen from the depths of obscurity into shallow obscurity and have finally found the time to write. I like the new format/approach of VIPER very much! You'll never find me complaining when a good newsletter gets better. Many comments, though, so here goes:

Please don't lose track of what the VIPER is for - primarily VIP users. I welcome wholeheartedly the articles on modifying ELFs or Studio IIs or whatever - but only to the point where they can run VIP software. Bringing them into the VIP fold is admirable and it will expand the market/audience for a VIPER that carries useful VIP software.

Thanks for listing my plea for assistance with the "blown" CT1024. It brought several responses with DSD coming through with everything I needed.

One more try - any other VIPER/VIPs in CT? A user group could be very productive and enjoyable.

You refer several times to the proper edge connectors. Amp-phenol 225-2221-110 or AMP 2-530668-6. Each time I've bought, measured, tried...I've always come up with .156 pin spacing, 5 mm row spacing - not 3.5 mm! Please steer us to a source of the proper sockets. I hate having to bend and forcefit improper connectors, and have resisted so far.

Enclosed in my check for PIPS I and PIPS II. I eagerly await volume III. Has anyone implemented an 1802 assembler for the VIP yet?

I must part with my Studio II - brand new condition, unmodified, with 4 game cartridges. Can probably sell to neighborhood video games freaks, but will give first shot to VIPER readers who want to modify the unit but can't find one.

Any further word on RCA's willingness to publish listings of Studio II games? Tennis game with "English" is especially intriguing.

Finally, what does one do when one cannot get SuperSound to run at all? Never has, and I've just had the time to mess with it recently. I'm extremely interested in developing a few ideas and software for/with this board, which will go to VIPER if you want it, but so far, no go.

Continued success to you and the crew. What are the new boards from ARESCO that you hinted at in the last issue?  
- Stephen Place 225 Main Street, Newington CT 06111

---

Steve - Wow! We'll do our best to answer each point in your letter: 1. Most of the Studio II material is being printed in our Studio II newsletter (which you can subscribe to for \$10/6 issues)...SII folks may not be ready, in general, for complete conversion to VIP, although we know it has been done.

2. One of the reasons we don't publish names and addresses unless you specifically ask is that many VIPER readers aren't up to club meetings. However, let's hope that people in your area will respond this time!

3. Ah, yes; the connectors. It's a long story, Steve. You see, when Rick asked a friend to make up the board, he said, "Do it your way - it's your project." So the friend grabbed the closest connector to him for the board, and lo! it had 5 mm spacing on it. Which we discovered wasn't easy to find. Try any of the industrial distributors: Hamilton Avnet, Cramer, Arrow; try hobby components dealers such as Jade or Advanced Computer Products. ACP is especially good about locating hard-to-find products.

4. It is rumored that a commercial software house (which already has some VIP software available) is "looking at" an 1802 assembler to run on the VIP. Won't give you their names, since I'm sure they won't want to be deluged with calls until a) they've made up their minds they're going to do it, and b) it's somewhere close to production.

5. Yes, we've recently had word from RCA about the Studio II listings. The word is "No." However, we're getting very well acquainted with the guy responsible, because we rarely let a whole week go by without giving him another opportunity to refuse to let us print the listings!

6. What one does when one cannot get any RCA board to run is a) return it to your dealer for repair (that's us) or b) send it to RCA for repair. Frankly, I recommend you send it to RCA, since if you send it to us, we'd have to send it to RCA anyway. There'd be twice as much in-transit time. We can offer to sell you a PIN-8 cassette (\$5), to let you check your board. The listing in the manual is almost unreadable. If you get the tape, and the board still fails, alternatives a) and b) sound like your best bet.

Write again soon - you manage to put into one letter most of the questions most of the people have. - Thanks, Terry & Rick



#### INTEREST INVENTORY/INQUIRY

We have (or can have) the little Trendcom printers for \$375. These printers will do upper and lower case letters on inexpensive thermal paper (which we can get for \$48/case)(We don't know yet how many rolls of paper are in a case.) If anyone out there is interested in obtaining this printer, we'll be willing to print a spec sheet (or mail you one).

The printer uses an "Ansley" connector and ribbon cable; the connector has 22 pins. I suspect you'll need to jerry up a card with the Ansley pinout at one edge and the VIP pinout at the other...and maybe we can find a local soul who'll be willing to work on that. Trendcom sells interface cards for the PET, the APPLE II (@ \$75!) and one for the TRS-80 (@ \$45), but nothing yet for the VIP...and no symptoms of intending to make one for the VIP. So, if we want one, people, we'll have to do it ourselves...amongst us. (Please notice that "US" has "U" in it!) If you're interested, let us know.

## LITTLE LOOPS by Tom Swan

### SHORT SHORTS

One of the things I like most about the RCA VIP is that short programs may be written and tested without going through a lot of rigmarole. The Elf too. Here's several Short Shorts that oughta strike your fancy.

#### KEYBOARD INPUT TESTER

This little cutie will allow you to examine the ASCII hex code for any key on a keyboard plugged into the right I/O port of your VIP. It may be used with any 1802 computer though you may have to change 0007 if you are using another flag line instead of EF-4. Also 0009's input instruction reflects the VIP's hardware configuration.

0000	F8	LDI	;Load "00" into D register
01	00		
02	B1	PHI R1	;Put in R1.1 (high byte)
03	F8	LDI	;Load "0B" into D register
04	0B		
05	A1	PLO R1	;Put in R1.0 (R1=000B now)
06	E1	SEX 1	;Set X=R1 to prepare for input
07	3F	BN4	;Loop here until EF-4 flag
08	07		; line indicates key is pressed
09	6B	INP	;Input the value at I/O port
0A	00	IDL	;Stop
0B	00		;ASCII value is here

To use the program, simply type a single key after flipping to run. The hex value of that key will be at location 000B, as the input instruction at 0009 automatically gates the value at the I/O port to the memory byte pointed to by R(X). Since X was set to equal 1 (for R1) and since R1 was set to equal 000B, that is where the input byte goes.

#### ELECTRIC ERASER

In my book Pips for Vips - I, I included a short routine to erase all on-card memory except the first few bytes. Here's a different routine that will erase all memory, on card and off including the program itself no matter how much memory you have installed in your VIP.

0000	C0	Lnbr	;Long branch to 0XD0
01	0X		;Enter high on-card memory address
02	D0		
--	--		

0XD0	F8	LDI	;	Load "00" byte into D register
D1	00			
D2	11	INC	R1	;R1=R1+1 ( <u>was</u> equal to 0XFF)
D3	51	STR	R1	;Store "00" at M(R(1))
D4	30	BR		;Loop to clear all bytes
D5	D2			

Replace the 0X's above with your highest available on-card RAM address -- normally 07 for 2K VIP's; 0B for 3K; and 0F for 4K. Do this even if you have off-card RAM installed. Notice that the program is in two parts, the first going in locations 0000-0002 and the second in 0XD0-0XD5. When you enter the second part, you will see the program being entered directly above the address characters displayed by the operating system. Never fear, the numbers will look a little funny, but nothing is wrong. If you make a mistake with the second part, you will have to reload the whole program, not just the part where you goofed, by the way. This is because the action of resetting the computer, then calling the operating system with RUN/Key C, erases the program from memory. I don't know how fast this program runs exactly, but you only need to flip to run for a second and "poof" RAM is clear!

#### DISPLAY PAGE SWITCHEROO

The following subroutine is not new with me -- I've seen it frequently in VIP programs and in the pages of VIPER. It changes the display page from the highest on-card memory page to any other page you want. Here's the way it is usually written:

```
0MTM 01F8
      05BB -- (The "05" may be set to any value)
      D400
```

Actually, the 01 byte and the last 00 byte are not needed. The following machine language subroutine will do exactly the same thing as the first:

```
OMMM F805 -- (Again, the "05" is just for this example)
      BBD4
```

This is shorter by two bytes. What happens is that RB.1 (the high 8 bit portion of register B) is set to the address of whatever page you want to display. The "05" byte above would cause page #5 to be displayed and may be replaced by your own value.

In the longer version above, I suspect the "01" byte to be some sort of marker used by the original programmer of this

subroutine. Whatever the intended purpose, it has vanished in the wake of a thousand pong games. Use the shorter version -- it makes more sense.

#### STACK IT TO 'EM

Some time ago I read in VIPER that calling machine language subroutines from within Chip-8 subroutines ends up clobbering the return addresses and will send your Lunar Lander into a tail spin. Not so! I've never had such a problem.

If you look closely at the interpreter, you will find that Chip-8 return addresses are placed on the stack with the pointer (R2) left pointing to the top of the stack. This means if your machine language subroutine uses the stack it will destroy the first byte there and therefore the return address for the Chip-8 sub goes down the drain. If the machine sub will not use the stack you just won't have that problem.

When you need to use the stack, first decrement R2 with a 22 DEC R2 instruction as the first byte of your machine language sub. Be sure to pop off all bytes you use during the sub. Then immediately before returning, increment the stack pointer with a 12 INC R2 instruction to reset R2. This will protect all information in the stack and is a pretty good practice for stack handling to follow anyway.

**PROJECT:** The title of this column is SHORT SHORTS. Not that it has anything to do with computers, but can you remember the name of the group who performed the song of the same name? More important, do you know what famous super group some of those performers were soon to form?

**NEXT MONTH:** The Sorted Details

**LAST MONTH'S ANSWERS:**

**ANSWER #1** - The BMMM sub contains a hidden operation which will cause the program to halt if the sub is called with V0=00. This will add 00 to the address of 0400 where the BMMM instruction exists, and the program will enter an endless loop at this point as control continually passes to 0400. The second sub in last month's column would need two additional instructions to do the same "halt if V0=00."

ANSWER #2 - New BMMM - shorter by 2 instructions (add this to Chip-8)

```
01A4 F8 LDI
A5 F0
A6 A7 PLO R7 ;R7 points to Chip-8 V0
A7 E7 SEX 7 ;X=7
A8 45 LDA R5 ;Get 2nd half Chip-8 instruction
               (low BMMM address)
A9 F4 ADD ;Add to V0
AA A5 PLO R5 ;Put in R5.0
AB 86 GLO R6 ;Get R6.0 (1st half instruction)
AC FA AND
AD 0F          ;Mask last 4 bits
AE 7C ADCI    ;Add possible carry from add
AF 00

01B0 B5 PHI R5 ;And place in R5.1
B1 D4 SEP R4 ;Return
```

ANSWER #3 - New Relative Addressing (add the following to your Chip-8 interpreter)

(begin jump up)

```
01A4 E6 SEX 6 ;R6 points to Chip-8 VX
A5 85 GLO R5 ;Get low address current program
               position
A6 F4 ADD ;Add number in VX twice
A7 F4 ADD ;      "      "
A8 A5 PLO R5 ;Return to R5.0
A9 95 GHI R5 ;Get high address of program counter
AA 7C ADCI    ;Add possible carry
AB 00
AC B5 PHI R5 ;Return to R5.1
AD D4 SEP R4 ;And return to fetch and decode
AE E6 SEX 6 ;(begin jump back)
AF 85 GLO R5

01B0 F7 SM      ;(same as above
B1 F7 SM
B2 A5 PLO R5 ;      --but
B3 95 GHI R5 ;
B4 7F SMBI    ;
B5 00          ;      --subtract VX)
B6 B5 PHI R5
B7 D4 SEP R4
```

In addition to the above, make the following changes to relocate the 6XXX and 7XXX subroutines:

```
01F2 45 56 D4
01F5 45 E6 F4 56 D4
-- 
0066 F2 F5
```

You have just added the following instructions to Chip-8:

FXA4 -- Jump forward by the number of Chip-8 instructions in VX (starting with next instruction = #1)

FXAE -- Jump backward by the number of Chip-8 instructions in VX (starting with this instruction = #1)

(NOTE: When this was written I was unaware of the article soon to be published in a future VIPER on Relative Branching. The difference here is that variable VX may be used to specify the number of instructions to be passed allowing different jumps to be performed on each loop depending on the value in VX. The previously published version is limited to a specific number of bytes to be jumped. The version here also has twice the range  $\pm 255$  instructions vs.  $\pm 255$  bytes in the other version.)



#### CAN'T THIS THING GO ANY FASTER?

as told to Tom Swan by members of the FOOSEE Club\*

Whenever someone says don't do this or you can't do that, I'm there at the starting gate rarin' to prove them wrong. (You can't quit your job, sell your house, sell your car, pack it up and move to Mexico! You can't!-- Buenos Dias.)

Page 38 of the Chip-8 manual, Chip-8 User Notes #6 says, "Do not turn off the CDP 1861 video chip in machine language subroutines. This will interfere with the proper operation of the Chip-8 interpreter." Here's a machine language subroutine that turns off the video, and here's how to turn it back on using a Chip-8 instruction already in your interpreter that they did not tell you about!

Why would you want to do this? Only one reason: speed. Chip-8 routines (and other MLS's) will run very much faster as they will not be interrupted 60 times a second for video display refresh. Think of your computer program as running in a series of jerky steps, stopping every 1/60 of a second while a thing called the interrupt routine takes care of display requirements. Remove the video and your program will run as smooth as a glistening thoroughbred rounding the turn for the wire.

For calculation routines when you don't mind losing the display momentarily, this is the ideal way to increase the speed of the calculation. (The display is not affected -- it is only turned off.) Now there are problems -- the manual wasn't wrong about that. You may not use the Chip-8 timer, the tone generator or the instructions that reference the hex pad keys. Trying to do so could result in irretrievable loops, but not necessarily so.

The following routine may be entered anywhere in memory. If you want, you may place it in the normal Chip-8 interpreter, say at 00FC-00FE where it won't interfere with anything. To call the routine, simply enter its address as a Chip-8 instruction when you want to turn the video off. For example, if the routine is located at 00FC, then the instruction 00FC (same as the address) will call this routine.

#### TELLY TURN OFF

##### Suggested address

```
00FC TVOFF : 22 DEC R2 ;Decrement stack pointer (X=2
                        always)
    FD      61 OUT      ;Turn off 1861 Chip--RX=RX+1
                        resets R2
    FE      D4 SEP     R4 ;Return
```

#### WHAT GOES OFF MUST COME ON

Now that you've turned off the telly, no doubt you will want to turn it back on. This capability already exists in your interpreter and is called with the instruction 004B: Turn on Television. (The "instruction" is actually the address of the routine at 004B that handles this.) By the way, if you happen to execute a 004B while the video is already on, the instruction functions as a NOP -- no operation -- and nothing bad will happen.

Remember not to use the tone, timer, or hex pad instructions -- they need the functioning interrupt to work. Also, the random number generator will spit out non-random sequences with the video off so don't use that either.

But now that I've told myself I can't do something, I'm really upset! Here's a way to use the tone generator in a way that takes advantage of the video off routine:

Sample: 6004;V0=04 --- V0=Value for tone generator  
F018;TONE --- But tone will not sound! (Not yet)  
00FC;OFF --- Turn off video--(Assuming routine  
@ 00FC-FE)  
|  
| Your calculation code--subroutine  
| call to a calculating routine, etc.  
004B;ON --- Upon return (or done) turn on video--  
Chip-8 will now function normally and  
tone will sound.

After your program is done calculating whatever it has to calculate, the video is turned back on. Since the video was turned off before the tone finished beeping, an automatic beep will sound when your calculations are done and the video comes back on. Happy calculating!

P.S. Try using this technique to speed up the sorting routines in this month's Little Loops column!

\* The Franklin, Oxford, Orville, Wilbur, Edison, Einstein they-said-it-couldn't-be-done club.

## FOOTBALL

by Frank Awtrey

This is the first program I've written in CHIP-8. I used the high resolution graphic display from Volume 1, issue 3, and worked out my own character table (and the means to get to the characters).

What the game lacks in graphics it makes up in strategy and fun. It requires a 4K system, but that shouldn't hold anyone back, since the additional 2K is so inexpensive nowadays.

THE GAME - When the game begins, the computer has the ball, and you're on defense. You have 15 seconds in which to select your play. On the screen, the time and plays are recorded, and when the computer has the ball, a white box appears to the right of the time. You select your play first. Due to time updates on the screen, you must be sure to hold the keys down long enough for the computer to scan it.

You're on defense, and you must try to select the same play as the computer selected. If you succeed, it will result in a loss of 0-5 yards (for the computer), an incomplete pass, a pass interception, a fumble, or a penalty for a loss of 5 to 15 yards. The computer will go for the touchdown when inside your 10 yard line on the fourth down. Field goals and punts can be attempted at any time, and intercepted passes can be returned as well as punts.

When you finally get the ball, you still have only 15 seconds in which to select your play. If you don't make it, the clock will be stopped. If you're within your own 10 yard line, no penalty is imposed, but if you aren't, you lose 5 yards in penalties.

The computer will attempt to pick your play, and if it isn't successful, you can gain up to 15 yards - or a breakaway - or a penalty.

The computer will attempt a Deep Pass with less than a minute remaining in either half if it is more than three points behind. \*WARNING\* The Deep Pass play should be reserved for emergency situations, since the interception rate is very high.

### THE PLAYS

<u>Key</u>	<u>Play</u>	
0	Run	0-15 yds
1	Pass	0-15 yds
2	Sweep	0-15 yds
3	Draw	0-15 yds
4	Deep Pass	15-47 yds
5	Punt	28-59 yds
6	Field Goal	40 yd line or closer
7	Clear Screen	
8	Time Out	3 per half

When FUM appears at the bottom of the screen, it signifies that a fumble has occurred. They're always recovered at the yard line where the ball was on the previous play.

When an M appears on the bottom of the screen, it indicates that a measurement must be taken. There's a 50% chance that the measurement will show that a first down has been reached, and, if not, the yards-to-go is so close to zero that a gain of 0 (less than a yard) will result in the first down.

If any garbage appears on the screen, use key 7 to clear it. I've tried to simulate all conditions, but if somehow I haven't thought of everything, this should correct it.

#### MODIFICATIONS

If you want to have possession of the ball when the game starts, change location 0207 from 00 to 01, and change location 05C7 from 01 to 00.

If you don't want the clock to stop when you're inside your own 10 yard line and can't decide on a play within the allotted fifteen seconds (or if you want to change the amount of time allowed), change 05E1. At present, 05E1 contains \$10, which is decimal 16.

If you want to change the way the measurements are done, change location 066E. If location 066E - 1678, no measurement is done in the present setup; if 066E - 1984, a measurement is taken.

An automatic game can be played by changing 0216 from E0A1 to C003 and change 0242 from 3900 to 1246.

To change the speed of the clock, change 05A1 from 09 to (00-FF). Higher numbers make the clock slower. The display time can be changed at 06A1 from OF to (00-FF).

#### OTHER COMMENTS

Address 070A stores the record of games won, and 070B stores games lost. If you want to keep this total correct from time to time, you could write these addresses after each load of the tape or write one page on tape. The record will start at 0 wins and 0 losses, and stay current for each load of the program.

When the game is over, the time display will change to show statistics. The two numbers on the left are the number of first downs earned by the computer, and the right two numbers show your first down.

When a plus sign shows beside the "yard line" (BALL ON +40, for example), it means you're inside the computer's 50 yard line (if you're on offense) or that the computer is inside your 50 yard line (if you're on defense).

The computer will go for a touchdown when inside your 10-yard line on a fourth down.

The score on the right of the screen is yours; the one on the left is the computer's.

#### HIGH RESOLUTION DISPLAY CHIP-8 CHANGES

<u>ADD.</u>	<u>DATA</u>	<u>ADD.</u>	<u>DATA</u>	<u>ADD.</u>	<u>DATA</u>	<u>ADD.</u>	<u>DATA</u>
0003	02	000A	0D	000D	06	0018	FA
007E	3F	0084	30	0085	E0	00D7	30
00D8	E6						

<u>ADDRESS</u>	<u>DATA</u>
00E0	9B 7C 00 BC 30 86 9C 7C 00 BC FB 10 30 FC
00FC	3A B3 30 D9
01FA	0D 45 0D 30
012A	08 (Change Character Page Pointer)
012E	FF (Allows for an index of 00-FF)

The changes at 012A and 012E allow page 08 to use 00 to FF as an index into a character table. For example, to display a letter "T", do the following:

6300 X=00  
 6500 Y=00  
 6A1D VA=1D; used to index table at 081D. 081D contains 82. That means at 0882, for 5 bytes, is the character "T".  
 2420 Subroutine call. Both 6A1D and 2420 can be stacked for a string of characters  
 0420 FA29 This is the display index  
 0422 D355 Show M(I) @ X,Y  
 0424 7305 Increment X by 5  
 0426 00EE Return.

#### VARIABLE ASSIGNMENTS

V0, V1, and V2 are variable  
 V3 X  
 V4 Down number  
 V5 Y  
 V6 Quarter  
 V7 Time (minutes)  
 V8 Time (seconds)  
 V9 Designates offensive team. V9=0 when computer is offense.  
 VA variable  
 VB Yards-to-go for first down  
 VC Computer's score  
 VD Player's score  
 VE Not used  
 VF Variable

#### SUBROUTINES

0302 C20F Gain on Run plays  
 049A C20F Gain on Pass plays  
 0BDC 6A20 Gain on Deep  
 0BE8 C20F Pass Plays  
 0288 CE31 Long Kickoff Return  
 028C CEOF Short Kickoff Return  
 0292 6AOA Kickoff Return not less than 10 yards  
 0C98 C11F Punt or interception return

	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>
0200	2C20	6C00	6D00	6900	6800	670F	6401	6B0A								
0210	2AB6	2280	123E	E0A1	1224	7001	3009	1216								
0220	22B2	147A	294E	C103	A708	F155	2568	29EE								
0230	4007	1AB2	A708	3008	3900	1310	12D0	6000								
0240	277A	3900	1216	3404	14B2	14CA	xxxx	23DC								
0250	6401	6B0A	23DC	28F0	3900	1274	6901	2A38								
0260	6ACD	8A04	3F01	1270	6A64	8A05	8EA0	00EE								
0270	8E00	00EE	6900	2A38	1260	9E00	8BE0	1CA8								
0280	22BA	1B90	3E03	128C	CE31	128E	CEO	4E31								
0290	12CC	6A0A	8EA4	A706	6064	80E5	F055	2A14								
02A0	2988	6ACD	8AE4	3F01	12DC	6A64	8AE5	8EA0								
02B0	12DC	25DA	300F	6000	00EE	6ACE	2CC8	3F00								
02C0	1352	6A28	6320	651B	2420	1352	2A14	16CC								
02D0	F165	4101	1480	3104	1460	1BC6	2500	12BA								
02E0	6310	6530	6A20	2420	6A18	2420	6A17	2420								
02F0	A70A	F165	A700	F033	7307	A703	F133	A700								
0300	1A9A	C20F	6ADF	2CC8	3F00	2D7A	2C1C	00EE								
0310	F165	4000	1460	4001	1480	4002	1460	4003								
0320	1460	4004	1BC6	1AD2	80A5	3F01	1932	193A								
0330	6300	6512	6A1D	2420	6A25	2420	A700	F733								
0340	A703	F833	A700	24E2	6A29	2420	A703	24E2								
0350	00EE	651B	6300	6A0B	2420	6A0A	2420	6A15								
0360	2420	6A15	2420	7303	6A18	2420	6A17	2420								
0370	7304	A700	FE33	2430	00EE	6004	1224	6300								
0380	6500	6A1A	2420	6A1E	2420	6A0A	2420	6A1B								
0390	2420	6A1D	2420	6A0E	2420	6A1B	2420	7303								
03A0	A700	F633	F265	8A20	2420	00EE	xxxx	6300								
03B0	6509	6A1C	2420	6A0C	2420	6A18	2420	6A1B								
03C0	2420	6A0E	2420	7303	A700	FC33	2430	7308								
03D0	A700	FD33	2430	00EE	6000	1216	6300	6524								
03E0	A700	F433	2430	4401	1C40	4402	1C4A	1C3A								
03F0	7302	6A0D	2420	6A18	2420	6A20	2420	6A17								
0400	2420	7302	6A0A	2420	6A17	2420	6A0D	2420								
0410	7301	2CC8	8A00	8AB5	3F00	1CA8	127A	xxxx								
0420	FA29	D355	7305	00EE	4000	14DA	8A00	1AEC								
0430	F265	1428	2420	8A20	2420	00EE	22BA	23DC								
0440	248E	2CC8	8024	28FA	6ACD	2CC8	3F00	14FO								
0450	8E00	8B24	4064	1780	1750	24A2	167C	xxxx								
0460	A708	F165	9010	1B4E	2652	2470	2500	1214								
0470	A708	F165	255E	2568	00EE	300F	1216	137A								
0480	A708	F165	9010	1A44	22BA	23DC	149A	C205								
0490	2D72	2622	26A0	2622	00EE	C20F	2658	146A								
04A0	xxxx	3404	14AE	6401	6B0A	28F0	1258	7401								
04B0	00EE	3700	1216	3602	14BC	14F8	3604	1216								
04C0	14F8	23AE	2250	2282	1214	2CEE	3F00	14D2								
04D0	1216	2CC6	3F01	151C	19A0	4100	1436	8A10								
04E0	1434	F265	8A10	1434	C101	3101	1682	1678								
04F0	6A64	8A05	8EA0	1452	2CEE	3F00	195C	1216								
0500	2330	2B14	15AE	267C	1214	6539	6325	A710								
0510	F265	A710	2430	00EE	2436	00EE	267C	2500								
0520	2CC6	3F01	1BF0	27A0	26A0	27A0	1506	C203								
0530	3203	17BC	C203	1C8C	6205	18FA	25A0	00EE								

	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>
0540	652B	6300	6A19	2420	6A25	2420	00EE	22BA								
0550	23DC	2D84	2492	2442	00EE	6532	1542	8A00								
0560	630C	652B	2420	00EE	8A10	630C	6532	2420								
0570	00EE	A706	6050	F055	6E14	19A4	6539	6300								
0580	6A10	2420	6A0A	2420	6A12	2420	6A17	2420								
0590	7302	6A18	2420	6A0F	2420	1424	2430	00EE								
05A0	6A09	26A2	A71A	F255	29EE	2330	6201	8825								
05B0	8A80	613C	8A15	3F00	15EE	2330	00EE	670E								
05C0	2CE6	15BA	6603	6901	1208	6300	6539	00EE								
05D0	9CD0	1B22	6800	2320	1CD0	A71A	F265	7201								
05E0	3210	153C	4900	18EC	3FFF	18D8	00EE	6101								
05F0	8715	37FF	15C0	15FE	3F01	15C0	15FE	3602								
0600	1604	15C4	3604	164C	6700	15D0	237E	7601								
0610	237E	1686	261C	26A0	261C	00EE	25CA	6A16								
0620	1420	25CA	6A15	2420	6A18	2420	6A1C	2420								
0630	6A1C	2420	7302	6A18	2420	6A0F	2420	7305								
0640	320F	1518	6A01	2420	6A05	1420	3605	160C								
0650	1686	267C	C1FF	16FA	2302	6A9B	8A04	3F00								
0660	16CE	4000	16CE	8E24	8B25	26C0	4B00	1678	(1984)							
0670	6A9B	8AB4	3F01	1682	6401	293C	23DC	22BA								
0680	00EE	24A2	167C	6201	15BE	xxxx	xxxx	257C								
0690	A700	F233	259C	26A0	257C	A700	259C	00EE								
06A0	6A0F	FA15	FA07	3A00	16A2	00EE	2CC8	6A64								
06B0	80A5	3F01	1A56	1CC0	xxxx	2A1C	6A06	00EE								
06C0	6ACD	8A04	3F01	8E00	268E	0DEE	23DC	26EC								
06D0	23AE	6A07	C00F	4001	26BA	3900	16E8	8CA4								
06E0	23AE	2250	2282	00EE	8DA4	16E0	271E	2738								
06F0	26A0	271E	2738	29EE	00EE	41FF	16CE	1658								

### BUFFER AREA 0700-070C

0700  
1 variable (used for decimal display)  
2

3  
4 variable (used for decimal display)  
5

6 Used for yds-to-go for touchdown

7 not used

8 Play 0 (your play)

9 Play 1 (computer's play)

A Games Won

B Games Lost

C not used

D not used

E not used

F not used

0710  
1 Punt yards (decimal display)  
2

3  
4 Time Out counter  
5

0716 First downs (computer)  
 7 First downs (yours)  
 8 not used  
 9 not used  
 A  
 B Time for next play  
 C

071E 6300 X=00

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0720	6539	6A1D	2420	6A18	2420	6A1E	2420	6A0C								
0730	2420	6A11	2420	00EE	6A0D	2420	6A18	2420								
0740	6A20	2420	6A17	2420	00EE	6A10	2420	00EE								
0750	6A9B	8A04	3F01	145A	1780	7C02	178E	25CA								
0760	6A1C	2420	6A0A	2420	6A0F	2420	6A0E	2420								
0770	6A1D	2420	6A22	2420	00EE	A71A	F033	00EE								
0780	275E	26A0	275E	23AE	3900	175A	7D02	2470								
0790	23AE	1572	6300	6539	6A17	2420	7303	174A								
07A0	6300	6539	6A17	2420	6A18	2420	7303	6A20								
07B0	2420	6A0A	2420	6A22	2420	00EE	27C4	26A0								
07C0	27C4	17DA	6300	6539	6A10	2420	6A18	2420								
07D0	6A18	2420	6A0D	2420	00EE	23AE	3900	17F0								
07E0	7C03	14C2	A706	6014	F055	1B62	7101	1948								
07F0	7D03	17E2	2794	26A0	2794	6AEB	2CC8	1328								

### INDEX CHARACTERS

ADDRESS	INDEX	CHAR	ADDRESS	INDEX	CHAR
0800	60	0	0819	BA	P
0801	69	1		1A	BF
0802	52	2		1B	C4
0803	5A	3		1C	C9
0804	6E	4		1D	82
05	50	5		1E	78
06	54	6		1F	7D
07	64	7	0820	A1	W
* → 08	56	8		21	9B
0A	5E	A		22	91
0B	48	B		23	96
0C	44	C		24	D3
0D	4C	D		25	CE
0E	40	E		26	30
0F	42	F		27	2B
0810	73	G		28	85
11	7A	H		29	35
12	8C	I,		2A	39
13	87	J			
14	A6	K			
15	AB	L			
16	A0	M	082B	00 00 00 00 00	
17	B5	N	0830	F8 F8 F8 F8 F8	
18	B0	O	0835	00 20 00 20 00	

### DATA FOR CHARACTERS

082B 00 00 00 00 00  
 0830 F8 F8 F8 F8 F8  
 0835 00 20 00 20 00

083A 00 00 60 60 00 00

END OF CHARACTER DATA

0 1 2 3 4 5 6 7 8 9 A B C D E F

08E0	6FFF	00EE	6004	6104	255E	6AA5	2CC8	3F01	254E
08F0	A706	F065	6A64	8A05	80A0	A706	F055	00EE	

0900	6300	6539	6A19	2420	6A1E	2420	6A17	2420
0910	6A1D	2420	7303	6A18	2420	6A0F	2420	00EE
0920	xxxx	xxxx	xxxx	xxxx	271E	2968	26A0	271E
0930	2968	A706	6014	F055	6E14	1B60	6B0A	A716
0940	F165	3900	17EC	7001	A716	F155	00EE	3901
0950	155E	4005	19A0	4006	151C	155E	80C0	7003
0960	80D5	3F00	1CB6	18E4	6A0B	2420	6A0A	2420
0970	6A0C	2420	6A14	2420	00EE	A700	FE33	632B
0980	6539	1430	2614	14E8	29CE	297A	26A0	29CE
0990	297A	00EE	2900	250A	26A0	2900	250A	00EE
09A0	22BA	23DC	6A1C	C21F	1C82	2CC8	8025	A710
09B0	F233	3F01	1928	4000	1928	A706	F055	2994
09C0	2C92	2250	22BA	146C	6900	6605	1208	25CA
09D0	6A1B	2420	6A0E	2420	6A1D	2420	6A2A	2420
09E0	00EE	2D4A	26A0	2D4A	00EE	6205	1D88	6A05
09F0	FA18	00EE	25CA	6A14	2420	6A12	2420	6A0C
0A00	2420	6A14	2420	6A18	2420	6A0F	2420	6A0F
0A10	2420	00EE	29F4	26A0	29F4	00EE	2A24	26A0
0A20	2A24	00EE	6300	6539	6A19	2420	6A0A	2420
0A30	6A1D	2420	7303	1798	6512	632D	6A26	2420
0A40	00EE	xxxx	CA0F	3A0F	1A5C	2A6E	2A96	26A0
0A50	2A6E	2A96	1C2C	24A6	267C	146A	2A6E	2A8C
0A60	26A0	2A6E	2A8C	267C	24A2	267C	146A	25CA
0A70	6A19	2420	6A0A	2420	6A1C	2420	6A1C	2420
0A80	7303	6A12	2420	6A17	2420	00EE	6A0C	2420
0A90	6A2A	2420	00EE	6A1D	1A8E	2430	7507	6310
0AA0	6A15	2420	6A18	2420	6A1C	2420	6A1D	2420
0AB0	1B82	2ABC	1214	6000	A713	F055	0D30	2330
0AC0	237E	23AE	22BA	23DC	2540	255A	3901	2A38
0ADO	00EE	A713	F065	4003	1B80	7001	A713	F055
0AE0	2AF0	2BA0	2AF0	1214	2470	1214	2420	14DE
0AF0	6300	6539	6A1D	2420	6A2A	2420	6A18	2420
OB00	6A2A	2420	00EE	6300	6539	6A17	2420	6A2A
OB10	2420	00EE	6A0F	C20F	82A4	00EE	265A	146A

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
OB20	xxxx	2B30	6900	237E	7601	237E	22BA	1BA8								
OB30	2B38	26A0	2B38	00EE	6310	6539	6A1C	2420								
OB40	6A2A	2420	6A0D	2420	6A2A	2420	00EE	CA1F								
OB50	4A1F	1B58	243C	146A	22BA	2B66	23DC	2470								
OB60	2250	22BA	1214	2B6E	26A0	2B6E	00EE	25CA								
OB70	6A0F	2420	6A1E	2420	6A16	2420	6A2A	2420								
OB80	00EE	7302	A703	2430	2330	A716	F165	1CAE								
OB90	4605	1BC0	CE07	1284	6700	6800	2330	1B9E								
OBA0	6AFF	26A2	2470	00EE	C201	3201	1BFC	19C8								
OBBO	2B06	2AF4	26A0	2B06	2AF4	2500	1AE8	xxxx								
OBC0	9CDC	1B94	1CD0	CA1F	4A1F	1BF8	CA03	4A03								
OBDO	1A4A	CA06	3A06	1A5C	22BA	23DC	6A20	1BE8								
OBE0	267C	26CE	1214	xxxx	C20F	82A4	2C18	1B1C								
OBFO	2C00	26A0	2C00	152E	2470	1BE0	6901	19CA								
OC00	25CA	6A0F	2420	6A10	2420	7303	6A1D	2420								
OC10	6A1B	2420	6A22	1420	A706	F065	8025	18FA								
OC20	6000	6100	A716	F155	6601	00EE	267C	2C98								
OC30	16AC	xxxx	F065	A70B	1CDC	4403	1C54	1C5A								
OC40	6A1C	2420	6A1D	2420	13F0	6A17	2420	6A0D								
OC50	2420	13F0	6A1B	2420	1C4E	6A1D	2420	6A11								
OC60	2420	13F0	2C6C	26A0	2C6C	1B60	6300	6539								
OC70	6AOB	2420	6A15	2420	6A14	2420	6A0D	2420								
OC80	00EE	420F	1C8A	82A4	19AA	1C64	3203	17F4								
OC90	1C64	C101	3101	00EE	C11F	A706	F065	8014								
OCA0	A706	F055	8E10	1988	A700	FB33	13D4	8700								
OCB0	8810	2330	1CB4	2CC6	3F00	1216	151C	xxxx								
OCC0	2258	26CE	146A	6AD7	A706	F065	8A04	00EE								
OCDO	8CD5	3F01	1CE2	A70A	F065	A70A	7001	F055								
OCEO	12E0	A70B	1C34	3201	1CF8	683B	00EE	A706								
OCFO	F065	6AOA	80A5	00EE	681B	CA1F	88A4	00EE								
OD00	1200	017A	4270	2278	2252	C419	F800	A09B								
OD10	FA0E	BOE2	E280	E220	A0E2	3C15	80E2	20A0								
OD20	341C	9832	29AB	2B8B	B888	3203	7B28	3004								
OD30	FB02	AE9B	BFFF	00AF	F800	5F1F	8F3A	382E								
OD40	8E3A	38D4	019B	FF01	BBD4	6300	6539	320F								
OD50	1D56	6A01	2420	6A05	2420	6A22	2420	6A0D								
OD60	2420	7302	6A19	2420	6A0E	2420	6A17	2420								
OD70	00EE	6ABB	2CC8	3F00	00EE	C11F	310F	00EE								
OD80	C103	3103	19EA	620F	29E2	74FF	00EE									

## IMPORTANT ROUTINE ADDRESSES

0200 - 0211 Initialize variables and display everything  
0212 - 024B Computer's turn  
024E - 0279 Turn over  
0280 - 02B1 Kickoff  
02BA - 02C0 Show + if ball is inside 50-yd line  
02D0 - 02DB Table of pointers for computer's plays  
02E0 - 02EF "W O N"  
02F0 - 0303 Won/lost record  
0304 - 030F Check for penalty  
0310 - 0327 Table of pointers for your plays  
0329 - 032F Determine if ball is inside or outside 20 yd line  
0330 - 0351 Time display  
0352 - 0379 "B A L L O N"  
037A - 03C7 "Q U A R T E R S C O R E"  
03F0 - 040F "D O W N A N D"  
0410 - 041D Check to see if first down is inside 10 yd line  
0420 - 0427 Subroutine to display characters  
0428 - 043B Subroutine to display decimal characters  
0440 - 045D Loss routine  
0460 - 0479 Plays 0, 2, and 3  
047A - 047F Part of penalty for delay of game  
0480 - 048D Routine for play 1  
048E - 0499 Check for, show, and erase loss of 0 - 5 yds  
04A0 - 04B1 Check down number; increment or go to Turn Over  
04B2 - 04C1 Check down & time for computer's play selection  
04C2 - 04C9 Part of safety routine  
04CA - 04D9 Check to see if inside 10 or 40 yard line, to determine punt or field goal  
04DA - 04E7 Part of decimal display and zero blanking  
04E8 - 04EF Part of measurement routine  
04F0 - 04F7 Part of loss routine  
04F8 - 04FF Check for Field goal or Run routine  
0500 - 0507 Get a random number for play time  
050A - 051B Routine to show return yardage  
051C - 0533 Field goal routine  
0534 - 053D Show Play =  
053E - 0549 Return from penalty  
0560 - 0571 Part of penalty (show yards) routine  
0572 - 057B Safety (Return to Main)  
057C - 059F "G A I N O F"  
05A0 - 05C9 Time routine  
05CA - 05DF Routine to get a common X and Y - save space  
05D0 - 05D9 Sudden death (more time)  
05DA - 0613 Check for 15 second limit; End of quarters  
0614 - 0621 Display "M" for measurement routine  
0622 - 063F "L O S S O F"  
0640 - 064B Part of routine to display penalty  
064C - 0651 Check for sudden death 5th quarter  
0652 - 0681 Gain routine  
068E - 069F Routine to show punt yardage  
06A0 - 06AB Time delay routine for displays  
06AC - 06BF Check for T.D. on interception return  
06C0 - 06CB Part of Gain routine

06CC - 06E7 Touchdown routine  
 06E8 - 06F9 Show and erase touchdown  
 06FA - 06FF Check for Breakaway  
 0700 - 071D Buffer area  
 071E - 0749 "T O U C H D O W N"  
 0750 - 075F Check for "+"; Display safety  
 0760 - 0779 "S A F E T Y"  
 0780 - 078F Store "0" in time for play counter  
 0780 - 0787 Go and show safety display  
 0788 - 0793 Determine and update score for safety  
 0794 - 07FF Get "G" and "N G" for safety  
 07A0 - 07BB "N O W A Y"  
 07BC - 07D9 "G O O D" - go and display it  
 07DA - 07DF Determine who scored field goal & update score  
 07E0 - 07EF Touchback (ball on 20 yd line)  
 07F0 - 07FF Show "N G" on field goal attempt & put ball on  
       20 yard line (or greater)  
 0800 - 08D7 Character Table  
 08D8 - 08D3 Check yard line on a penalty  
 08D4 - 08DF Play 4 - with less than a minute to go  
 08F0 - 08FF Change yds-to-go after a turnover  
 0900 - 091F "P U N T O F"  
 0928 - 0939 Touchback - ball on 20; display it  
 093A - 094D  
 094E - 095B Plays 5 & 6  
 095C - 0967 Determine if computer is losing by      3 points  
 0968 - 0979 "B A C K"  
 097A - 0983 Show return yardage  
 0984 - 0987 Part of measurement routine  
 0988 - 0993 Show ret. and yds display  
 0994 - 099F Show punt and yards  
 09A0 - 09C7 Punt play  
 09C8 - 09CD Part of sudden death routine  
 09CE - 09E1 "R E T."  
 09E2 - 09E9 Show penalty display  
 09EA - 09ED Part of 5 yd penalty routine. V2=yards  
 09EE - 09F3 Tone sounding routine  
 09F4 - 0A13 "K I C K O F F"  
 0A14 - 0A1B Show kickoff display  
 0A1C - 0A23 Show "PAT NG"  
 0A1D - 0A37 "P A T"; Get NG display  
 0A38 - 0A41 Show white box if computer is on offense  
 0A44 - 0A6D Pass Play (Play 1). Do interception &  
       Incomplete checks  
 0A6E - 0AAF "P A S S I N C ."; "L O S T"  
 0AB0 - 0AB5 Play 7  
 0AB6 - 0ADO Reset everything  
 0AD2 - 0AEF Time out (Play 8)  
 0AF0 - 0B13 ". O . N ."  
 0B14 - 0B1F Random number for time; each play at least 15 sec.  
 0B20 - 0B2F Sudden change of quarters  
 0B30 - 0B4D Show "S.D"; "S . D ."  
 0B4E - 0B91 Check for and show "FUM.>"; "F U M ."  
 0B92 - 0B9F Part of first down display at end of game  
 0BA0 - 0BA7 Time delay for Time out (play 8)  
 0BA8 - 0BAF Sudden death routine to pick who has ball first  
 0BB0 - 0BBD Show "N.T.O." - No Time Outs  
 0BC0 - 0BC5 Check to see if score tied for sudden death

OBC6 - OBEF Deep Pass Play (play 4)  
OBD0 Intercepted  
OBD6 Incomplete  
OBDA Long Gain (partial)  
OBE0 Touchdown  
OBE8 Long Gain (partial)  
OBFO - OC17 Show & Erase F.G. TRY; "F . G . T R Y"  
OC18 - OC1F Part of gain and long gain subroutines  
OC20 - OC2B Zero first downs counter  
OC34 - OC39 Game lost  
OC3A - OC61 Check which down it is  
OC62 - OC6B Show "BLKD"  
OC6C - OC80 "B L K D"  
OC82 - OC91 Check for blocked pass  
OC92 - OC97 Check for punt  
OC98 - OCA7 Ret.; Get yards; Decrement yards  
OCA8 - OCB3 Show first downs  
OCB4 END OF GAME  
OCB6 - OCBD Field Goal or Run Play  
OCC0 - OCC5 Pass returned for TD  
OCC6 - OCCF Check for greater or less than 50 yds  
OCD0 - OCD5 Check to see who won  
OCD6 - OCE1 Computer won  
OCE2 - OCE5 You won  
OCE6 - OCED Part of time. If minute has ended, go to 59 sec.  
OCEE - OCF7 Check for inside 10 yd line  
OCF8 - OCFF Part of time subroutine to generate second 5  
OD00 - OD49 Machine language subroutine for high resolution  
OD4A - OD71 Check for 15 yd penalty; "1 5 Y D P E N"  
OD72 - OD8C Check to see if a penalty; how much; decrement  
down counter by 1

---

Editor's Note: I have tried to make certain all this code is correctly typed, but of course I can't guarantee it. (We've been through this before, haven't we friends?) Even so, you can purchase the tape for \$5.00 and avoid having to type it all in. And, better yet, for a mere \$2.95 more, you can have copies of Frank's original, handwritten notes. There are 51 pages of code, 5 pages of computer output giving the game description, and half-a-page of subroutine listings. I would personally appreciate it if you'd send a dollar or so for shipping all this to you if you want it, since it will cost a bunch.

And, of course, you can call us if you have problems with it, and if we are told of any errors, we'll print them in upcoming issues. - Terry (301) 730-5186

\*\* NOTICE \*\*

I noted Doug Smith's letter in issue 2.02 regarding mail order sources for RCA chips. I've been referred to Hamilton Avnet, an industrial electronic supply house, which will sell single chips. By calling 1-800-555-1212, one can get the toll-free number of the nearest branch (there are over 60). But be advised: they are typically slow. 4 weeks delivery.

(Above notice sent in by Bob ? - no last name on his letter. - Terry)

# GOOD NEWS!

for VIP™ owners:

H.C.Will<sup>TM</sup> Microcomputer Products  
introduces its line of  
**VIPWARE**

**we're new and so are our ideas!**

**Keep up to date on the  
latest VIP<sup>TM</sup> WARE,**

**send a self-addressed  
stamped envelope to:**

**H.C. Will<sup>IV</sup>**

**microcomputer products  
P.O. BOX 347  
PINEBROOK NJ 07058**

VIP™ IS A TRADEMARK OF RCA

## MODIFICATIONS TO KALEIDOSCOPE

by Charles R. Williams

Here is a modification that involves a few changes to the VIP Kaleidoscope program.

I came upon this accidentally while trying to modify the Kaleidoscope for 2-page Chip-8 display. This has resulted in what I call Wacko Kaleidoscope, because it acts wacko! The key entries don't work like they should, but it makes some really weird patterns.

To implement, use the 2-page Chip-8 mod described in VIPER Volume 1, page 10 (#3) and load the original Kaleidoscope program into M(0260) to M(02D9) and make the following changes:

M(0266)-621F; M(0268)-2292; M(026A)-A260  
M(0274)-127C; M(027A)-1268; M(027E)-A260  
M(0286)-127C; M(028C)-127C; M(028E)-2292  
M(0290)-127E; M(02A2)-A2D7; M(02A8)-6B3F  
M(02B4)-6B1F; M(02BC)-6B3F; M(02C4)-6B3F

I hope you enjoy this, I do.

## PRODUCT REVIEW

### VP-700 TINY BASIC ROM BOARD AND MANUAL

PRICE -- \$39.

by Tom Swan

A rose is a rose, and a horse is a horse of course of course, but one Basic interpreter may vary from another to such a degree that many times programs can not be swapped back and forth without major surgery. This is the case with RCA's Tiny Basic ROM board for the VIP. Yes it speaks Basic, the Beginner's All-Purpose Symbolic Instruction Code. But do not expect to buy a book of games in Basic to enter directly into your Cosmac computer -- this is truly a tiny implementation of the famous interpreter.

To compare the VIP's Basic to an extended floating-point Microsoft version would be unfair, however. The two may as well be different languages. A saner approach to this review is to discuss Tiny Basic on its own merits, my only goal (unlike some reviewers) to let you know what you will be getting before you write out that check.

First the manual. Terry Laudereau wrote it though you won't find that fact in between the covers. I could nitpick about a few things -- there are occasional errors. For instance, Section III states "If the words Command Only appear, no line number may be used with the key word." Yet the first example of the first key word (a "command only NEW" statement) is given with a line number.

What the manual does have is clarity and organization. If there's anything I know Terry to be good at, it is organizing. Plenty of examples are given that allow you to program while you learn and the book ends with a two-player Tic-Tac-Toe program that you will want to add to your program library. A glossary runs through terms to help increase your general computing knowledge. Each Basic instruction is covered extensively and even if you have no prior experience with the language you will need no other materials to get started. The Basic may be Tiny, but this manual isn't, and I'm not referring to the bulk of its 80 pages alone.

One of the nice things about VIP Tiny Basic is it takes advantage of the machine on which it runs. Graphics are as easy to program as they are in Chip-8 and if you have the Color or Simple Sound boards, the language includes a unique vocabulary to operate these peripherals. Saving and loading programs are even easier than with Chip-8 programs as you do not need to specify the starting address or the number of pages to be read/written.

Schematics in the manual illustrate simple circuits that may be added to turn a cassette player on or off automatically. The hookup information for an ASCII keyboard is also given. You must own a keyboard to use the Tiny Basic Board.

The interpreter sits handily in ROM so to take maximum advantage of your memory size (up to 32K). When you flip the run switch up, Tiny Basic is "READY" for your next command. There are 26 variables (each letter of the alphabet) plus one subscripted (A(1), A(2),...A(N)) variable for your use. A full character set is included and the usual math operators: +-\*/>. Double precision math routines give you the same number range (-32,768 to +32,767) as an Apple II. As with most Basics, many commands may be used in the immediate mode (as opposed to using them within a program) so your Cosmac can now function as a calculator with equation solving capability. The only serious absentee to me is the lack of a way to drop into machine language. I'm "pro 1802 machine code" and I wish I had a way to get to it from Tiny Basic.

If you want a hands-on, economical introduction to Basic, this board is for you. It is probably the most sophisticated peripheral offered for the VIP (the Super Sound board comes close for sure). Combined with its excellent manual, the Tiny Basic board offers a unique addition to your VIP computing experience.

\*\*\*\*\*

P.S. Once you have the board up and running, you will find an excellent program in the February '79 issue of BYTE magazine titled "Unlimited Precision Division" by Jeff Raskin. With only minor changes in Print and Input statements I had the program running in a few minutes.

## GET READY FOR MORE PIPS!

Due to the enthusiastic response to PIPS I and PIPS II, Tom Swan has prepared Volume III of PIPS. Just as in the first two volumes, you'll find the same detailed documentation, the same carefully commented source code, and the same thoughtful explanations of how you can modify the programs to meet your own desires. And all of the information is delivered in the unique and readable style that is the hallmark of all of Tom's work.

Volume III is devoted to just two programs - two of the best games we have ever seen on the VIP: VIP-FLOP and VIP-OKER. VIP-OKER lets you sit in on a game of five-card draw poker with three computerized opponents (Rick, Terry, and Tom!). Each player has a different strategy; one bluffs a lot, one bluffs hardly ever, and one bluffs only now and then. Naturally, you don't know which player has which style (it changes each time you re-run the program), but each will apply his (or her) strategy consistently throughout the game. The program follows all the rules of draw poker, and you can examine the program to be sure the computer isn't peeking at your hand!

As for VIP-FLOP, here's what Tom himself has to say about it in the introduction to the book:

"Othello,\* the box game similar to your COSMAC VIP-FLOP, has been a popular game on computers for several reasons. For one, it isn't terribly difficult to program, although the method of figuring the computer's move duplicates chess, checkers, and other games, using a look-ahead feature to make up the computer's mind. Also, the complexity of manipulating the pieces during play - there's a good chance that players will make errors in flopping poker chips on a board - make this game an excellent choice for a television display. The computer handles all these chores, so the board is always "right" - something a "boxed" board game cannot do.

"VIP-FLOP is supplied in three versions. You can play against the computer, you can play with a friend, or you can sit and watch while the VIP plays against itself, a feature that can be used to demonstrate the game to a beginner or as a way to test new evaluation routines you might write yourself and insert. Nine levels of play are possible and the VIP will require from one (or two) seconds to as long as 15 minutes to figure its next move. At the highest level, the program looks eight moves ahead - and is a very tough customer to beat. When you play with your VIP, you can let the computer go first; if you're stumped during any part of the game, you can even ask the computer to recommend a move for you!"

---

\*Othello is a Registered Trademark of CBS Corporation

(Editor's note- This "Order Form" business is getting out of hand, folks. How about we skip it? The first two issues of this Volume had a full page of order form; the third and 4th had an abbreviated version. In this issue, how about we don't bother? We'll start putting in an order form about every other month, if no one objects. That way, we'll have more space for interesting articles. This month, we'll just remind you that PIPS III is available for \$14.95 until January 15 - and after that, it will be \$19.95.

Oh - must remind you about the Light Pen (\$19.95 without the cassettes, \$29.95 with the cassettes). And, while you're at it, how about letting us know whether you're interested in the \$375 Trendcom printer (without interface card). Below, since we didn't have room for it anywhere else, is the printout from the Trendcom. It doesn't, as I mentioned elsewhere, reproduce very well! - Terry)

\*\*\*\*\*  
TRENDCOM

THE QUICK BROWN FOX JUMPS OVER LAZY DOGS

abcdefghijklmnopqrstuvwxyz

!"#\$%&/(\*+,-./;:<=>?@[\^]~\_`{|}~

0123456789

TRENDCOM

THE QUICK BROWN FOX JUMPS OVER LAZY DOGS

abcdefghijklmnopqrstuvwxyz

!"#\$%&/(\*+,-./;:<=>?@[\^]~\_`{|}~

0123456789

TRENDCOM

THE QUICK BROWN FOX JUMPS OVER LAZY DOGS

abcdefghijklmnopqrstuvwxyz

!"#\$%&/(\*+,-./;:<=>?@[\^]~\_`{|}~

0123456789

TRENDCOM

THE QUICK BROWN FOX JUMPS OVER LAZY DOGS

abcdefghijklmnopqrstuvwxyz

!"#\$%&/(\*+,-./;:<=>?@[\^]~\_`{|}~

0123456789

TRENDCOM

THE QUICK BROWN FOX JUMPS OVER LAZY DOGS

abcdefghijklmnopqrstuvwxyz

!"#\$%&/(\*+,-./;:<=>?@[\^]~\_`{|}~

0123456789

TRENDCOM

THE QUICK BROWN FOX JUMPS OVER LAZY DOGS

abcdefghijklmnopqrstuvwxyz

!"#\$%&/(\*+,-./;:<=>?@[\^]~\_`{|}~

0123456789

TRENDCOM

THE QUICK BROWN FOX JUMPS OVER LAZY DOGS

abcdefghijklmnopqrstuvwxyz

!"#\$%&/(\*+,-./;:<=>?@[\^]~\_`{|}~